

EFFECT OF STUDENTS' INTELLECTUAL ABILITY ON STUDENTS' MOTIVATION TOWARD LEARNING AT UNIVERSITY LEVEL

Original Article

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ABSTRACT

Background: Students' intellectual ability significantly impacts their motivation toward learning, influencing both intrinsic and extrinsic motivational drivers. Higher intellectual ability is often associated with curiosity and enjoyment in learning, while lower intellectual ability tends to make students rely more on external rewards and reinforcements. Motivation, in turn, drives persistence and engagement in academic tasks, making the interplay between intellectual ability and motivation crucial for achieving educational success, particularly at the university level.

Objective: The study aimed to assess the levels of students' intellectual ability and motivation (intrinsic and extrinsic) toward learning and to examine the effect and relationship between intellectual ability and motivation among university students.

Methods: The study adopted a descriptive research design based on the positivist paradigm of quantitative research. The population consisted of all 39 public and private universities in Lahore District. A multistage sampling technique was employed, including stratified and cluster sampling, to select a sample of 750 students from five public and nine private universities. Data were collected using validated questionnaires adapted for intellectual ability and motivation. Instrument validity was assessed through expert opinion, and reliability was confirmed with Cronbach's Alpha scores of 0.881 and 0.854, respectively. Data were analyzed using SPSS, employing descriptive statistics, Pearson correlation, and regression analysis to meet the study objectives.

Results: The results revealed that students' intellectual ability significantly affected their overall motivation ($B=1.068$, $Beta=0.492$, $t=15.44$, $p=0.000$), intrinsic motivation ($B=0.972$, $Beta=0.435$, $t=13.20$, $p=0.000$), and extrinsic motivation ($B=1.165$, $Beta=0.353$, $t=10.33$, $p=0.000$). A moderate positive correlation was observed between intellectual ability and overall motivation ($r=0.492$, $p=0.000$), intrinsic motivation ($r=0.435$, $p=0.000$), and extrinsic motivation ($r=0.353$, $p=0.000$). Mean scores for intellectual ability ranged from 2.09 to 2.36, reflecting moderate levels, while intrinsic and extrinsic motivation also showed moderate agreement, with the highest scores for curiosity ($M=2.29$) and reward-driven participation ($M=2.30$).

Conclusion: The findings highlighted a significant relationship between students' intellectual ability and motivation, demonstrating that intellectual ability positively influences both intrinsic and extrinsic motivational dimensions. The study emphasized the need for tailored instructional strategies to support diverse learners and foster balanced motivational drivers. Addressing individual intellectual levels through inclusive learning environments is crucial for promoting academic engagement and success.

Keywords: Cognition, extrinsic motivation, intrinsic motivation, learning, questionnaires, students, universities.

INTRODUCTION

The relationship between intellectual ability and motivation in students is a foundational area of study in educational psychology, emphasizing their crucial roles in shaping academic outcomes (1). Intellectual ability, encompassing cognitive skills such as reasoning, memory, and problem-solving, significantly impacts how students engage with and respond to learning tasks. This cognitive capacity not only determines their ability to comprehend and solve academic challenges but also influences their motivation toward learning. Motivation, whether intrinsic or extrinsic, is a driving force that dictates the persistence, effort, and strategies students employ to achieve academic goals (2). A nuanced understanding of how these two constructs interact reveals the dynamic interplay that affects students' academic engagement and success (3).

Students with higher intellectual ability often exhibit greater intrinsic motivation, driven by a natural curiosity and enthusiasm for learning (4). This is primarily due to their enhanced sense of competence, which allows them to approach complex tasks with confidence and persistence. Conversely, students with lower intellectual ability may face difficulties in academic comprehension, leading to frustration and diminished motivation. The repeated experience of failure can further reinforce negative self-perceptions, creating a cycle of disengagement and reduced effort. However, motivation is not solely contingent upon intellectual capacity (5). Factors such as self-efficacy, goal orientation, and the perceived value of learning tasks play an equally significant role. While students with higher intellectual ability often develop higher self-efficacy due to their consistent success, those with lower intellectual ability may develop fixed mindsets, perceiving their capabilities as static and unchangeable. This mindset can hinder resilience and deter the willingness to embrace academic challenges (6).

The complexity of this relationship is further underscored by environmental and contextual factors (7). Classroom climate, teacher attitudes, and peer interactions all mediate the influence of intellectual ability on motivation. Supportive learning environments that promote inclusivity, encouragement, and a sense of belonging can nurture motivation in students, irrespective of their cognitive capacities (8). Effective instructional strategies, such as differentiated teaching and formative assessments, can bridge the gap between students of varying intellectual abilities, ensuring that each learner experiences a sense of achievement and competence. Cultural and societal contexts also shape this dynamic. In collectivist societies, for instance, motivation may stem from fulfilling communal responsibilities, whereas in individualistic cultures, it often aligns with personal achievements. Such variations highlight the importance of addressing the cultural diversity of learners when examining their intellectual and motivational trajectories (9).

Developmental stages further contribute to the evolving relationship between intellectual ability and motivation. Younger students, influenced by extrinsic motivators such as rewards and praise, often require external reinforcement to sustain their efforts. As they mature, intrinsic motivation gains prominence, aligning with intellectual growth and personal interests (10). Adolescence, a critical period for self-regulated learning, marks the development of skills such as goal-setting, progress monitoring, and adaptive strategies. Intellectual ability during this phase significantly influences these self-regulatory behaviors, shaping long-term academic habits and success (11).

Advances in neuroscience have illuminated the biological mechanisms underlying the interaction between intellectual ability and motivation. Neural pathways connecting the prefrontal cortex, responsible for executive functions, with the brain's reward system underscore how cognitive and emotional processes jointly influence learning behaviors. Appropriately challenging tasks and immediate feedback can activate these pathways, enhancing intellectual engagement and motivation (12). Emotional factors such as anxiety, resilience, and self-esteem further complicate this relationship. Students with high intellectual ability may struggle with motivation due to anxiety or self-doubt, while those with lower ability may excel when equipped with emotional resilience and a growth mindset (13). Interventions targeting these emotional aspects, such as fostering a growth mindset and promoting mastery-oriented goals, can significantly enhance motivation across intellectual levels.

The role of parents and caregivers cannot be overlooked in this context. By providing a stimulating home environment and reinforcing positive attitudes toward learning, parents can nurture both intellectual and motivational growth. Emphasizing effort and perseverance rather than innate ability helps mitigate the negative effects of lower intellectual ability on motivation. This highlights the importance of a holistic approach that addresses cognitive, emotional, and environmental dimensions (14).

In light of these considerations, this study aims to explore the intricate relationship between intellectual ability and motivation among university students. Specifically, it seeks to assess the levels of intellectual ability and both intrinsic and extrinsic motivation, examine the relationship between these variables, and analyze the extent to which intellectual ability influences students' motivation toward learning. These objectives aim to provide actionable insights for educators, parents, and policymakers seeking to optimize academic outcomes and create equitable, supportive learning environments for all students.

METHODS

The study employed a descriptive research design, aligning with the positivist philosophical paradigm of quantitative research. The population consisted of all public and private universities in Lahore District, totaling 39 universities, of which 16 were public and 23 were private. A multistage sampling technique was utilized to ensure comprehensive representation. Initially, the population was stratified into two strata (public and private) using stratified sampling. Subsequently, a cluster sampling method was applied to divide the population into three clusters based on geographic location. From each cluster, three private universities and two public universities were selected through simple random sampling. Ultimately, a sample of 750 students was drawn, with 50 students randomly selected from each university.

The data collection instrument consisted of two validated questionnaires. The first was an adapted questionnaire to measure students' intellectual ability, developed with reference to existing tools from previous research. The second was a self-developed five-point Likert scale designed to assess students' motivation toward learning, developed with insights from prior research studies and expert input. To ensure content validity, the instruments were evaluated by subject-matter experts. Reliability was tested through pilot testing, with Cronbach's Alpha values calculated for internal consistency. The reliability scores for the intellectual ability questionnaire and the motivation questionnaire were 0.881 and 0.854, respectively, indicating a high level of dependability, as both exceeded the commonly accepted minimum threshold of 0.75.

Primary data was collected using the administered questionnaires, which were distributed to the selected participants. Data analysis was conducted using the Statistical Package for Social Sciences (SPSS). The first research objective, which focused on levels of intellectual ability and motivation, was analyzed using descriptive statistics, specifically means and standard deviations. The second objective, examining the relationship between intellectual ability and motivation, employed Pearson correlation analysis to identify associations. To address the third objective, the effect of intellectual ability on motivation, regression analysis was performed, with separate models run for intrinsic and extrinsic motivation.

RESULTS

The results revealed significant insights into the relationship between students' intellectual ability and their motivation toward learning. The analysis of intellectual ability showed moderate levels across multiple indicators, with mean scores ranging from 2.09 to 2.36 on a five-point scale. Students demonstrated relatively higher agreement with statements related to achieving high grades ($M=2.36$, $SD=1.21$) and participating in class discussions ($M=2.35$, $SD=1.17$). Intrinsic motivation exhibited moderate levels, with the highest mean observed for curiosity about topics unrelated to studies ($M=2.29$, $SD=1.10$). Extrinsic motivation was similarly moderate, with students being most motivated by rewards or prizes in class activities ($M=2.30$, $SD=1.13$). Regression analysis highlighted a highly significant effect of intellectual ability on overall motivation ($B=1.068$, $Beta=0.492$, $t=15.44$, $p=0.000$), intrinsic motivation ($B=0.972$, $Beta=0.435$, $t=13.20$, $p=0.000$), and extrinsic motivation ($B=1.165$, $Beta=0.353$, $t=10.33$, $p=0.000$). Pearson correlation values indicated a moderate positive relationship between intellectual ability and overall motivation ($r=0.492$, $p=0.000$), intrinsic motivation ($r=0.435$, $p=0.000$), and extrinsic motivation ($r=0.353$, $p=0.000$). These findings suggest intellectual ability plays a crucial role in shaping motivational constructs, yet the moderately low mean scores may indicate areas requiring educational interventions.

Table 1 Students' intellectual ability

Items	N	Mean	S.D.
I am skilled at identifying logical fallacies in arguments.	750	2.21	1.041
I can evaluate the credibility of information sources.	750	2.28	1.065
I enjoy discussing and debating different viewpoints.	750	2.21	1.017
I can draw conclusions based on evidence and reasoning.	750	2.21	1.029
I enjoy coming up with new ideas or inventions.	750	2.18	1.014
I can express myself creatively through writing, art, or music.	750	2.17	1.050
I like to explore unconventional solutions to problems.	750	2.19	1.085
I can see connections between seemingly unrelated ideas or concepts.	750	2.14	1.114
I consistently achieve high grades in my classes.	750	2.36	1.213
I feel confident in my ability to succeed academically.	750	2.21	1.091
I actively participate in class discussions and activities.	750	2.35	1.170

Items	N	Mean	S.D.
I enjoy learning new things and challenging myself intellectually.	750	2.22	1.103
I am willing to put in extra effort to overcome challenges.	750	2.12	1.035
I seek out opportunities to expand my knowledge and skills.	750	2.09	1.113
I am enthusiastic about my academic pursuits.	750	2.22	1.087
I can adapt my approach when faced with unexpected obstacles.	750	2.16	1.018
I am open to considering alternative viewpoints or perspectives.	750	2.24	1.059
I learn from my mistakes and use them as opportunities for growth.	750	2.26	1.107
I am comfortable stepping out of my comfort zone to try new things.	750	2.30	1.099
I can quickly adapt to changes in my learning environment or circumstances.	750	2.20	1.064
I actively participate in extracurricular activities related to my academic interests.	750	2.32	1.153
I believe in using my intellectual abilities to contribute positively to society.	750	2.14	1.109

The above table illustrates the students' intellectual ability description. According to the respondents responses, I am skilled at identifying logical fallacies in arguments (M=2.21; SD=1.04). I can evaluate the credibility of information sources (M=2.28; SD=1.06), I enjoy discussing and debating different viewpoints (M=2.21; SD=1.01), I can draw conclusions based on evidence and reasoning (M=2.21; SD=1.02), I enjoy coming up with new ideas or inventions (M=2.18; SD=1.01), I can express myself creatively through writing, art, or music (M=2.17; SD=1.05), I like to explore unconventional solutions to problems (M=2.19; SD=1.08), I can see connections between seemingly unrelated ideas or concepts (M=2.14; SD=1.11), I consistently achieve high grades in my classes (M=2.36; SD=1.21), I feel confident in my ability to succeed academically (M=2.21; SD=1.09), I actively participate in class discussions and activities (M=2.35; SD=1.17), I enjoy learning new things and challenging myself intellectually (M=2.22; SD=1.10), I am willing to put in extra effort to overcome challenges (M=2.12; SD=1.03), I seek out opportunities to expand my knowledge and skills (M=2.09; SD=1.11), I am enthusiastic about my academic pursuits (M=2.22; SD=1.08), I can adapt my approach when faced with unexpected obstacles (M=2.16; SD=1.01), I am open to considering alternative viewpoints or perspectives (M=2.24; SD=1.05), I learn from my mistakes and use them as opportunities for growth (M=2.26; SD=1.10), I am comfortable stepping out of my comfort zone to try new things (M=2.30; SD=1.09), I can quickly adapt to changes in my learning environment or circumstances (M=2.20; SD=1.06), I actively participate in extracurricular activities related to my academic interests (M=2.32; SD=1.15), I believe in using my intellectual abilities to contribute positively to society (M=2.14; SD=1.10). Overall, respondents' responses reflected toward the level of agreement.

Table 2 Intrinsic motivation

Items	N	Mean	S.D.
I feel a sense of accomplishment when I understand a challenging concept.	750	2.16	1.068
I am curious about topics even if they are not directly related to my studies.	750	2.29	1.106
I find joy in the process of learning itself, regardless of grades or rewards.	750	2.11	1.044
I actively participate in class discussions and activities.	750	2.29	1.108
I seek out additional information or resources related to topics I find interesting.	750	2.12	1.030
I set specific goals for my learning (e.g., grades, skills, knowledge).	750	2.13	1.048
I am motivated to achieve my goals, even when faced with obstacles.	750	2.09	.971
I believe that effort and persistence are important for reaching my goals.	750	2.05	1.045
I am willing to invest time and energy to improve my academic performance.	750	2.09	.988
I believe that my efforts will lead to positive outcomes in my learning.	750	2.08	1.062

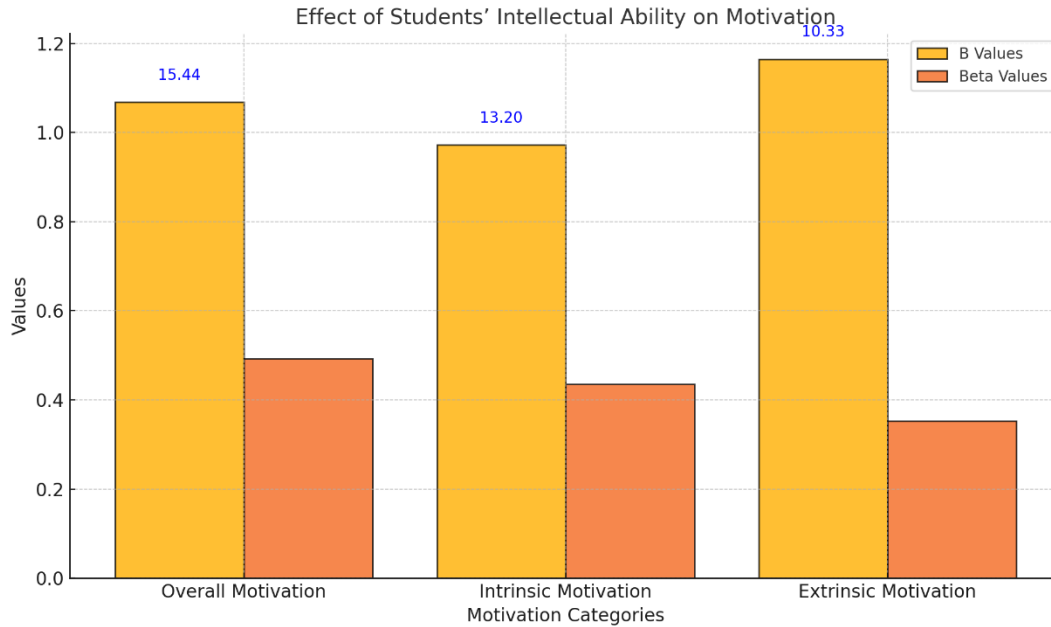
The above table illustrates the intrinsic motivation description. According to the respondents' responses, I feel a sense of accomplishment when I understand a challenging concept (M=2.16; SD=1.06), I am curious about topics even if they are not directly related to my studies (M=2.29; SD=1.10), I find joy in the process of learning itself, regardless of grades or rewards (M=2.11; SD=1.04), I actively participate in class discussions and activities (M=2.29; SD=1.10), I seek out additional information or resources related to topics I find interesting (M=2.12; SD=1.03), I set specific goals for my learning (e.g., grades, skills, knowledge) (M=2.13; SD=1.04), I am motivated to achieve

my goals, even when faced with obstacles ($M=2.09$; $SD=0.97$), I believe that effort and persistence are important for reaching my goals ($M=2.05$; $SD=1.04$), I am willing to invest time and energy to improve my academic performance ($M=2.09$; $SD=0.98$), and I believe that my efforts will lead to positive outcomes in my learning ($M=2.08$; $SD=1.06$). Overall, respondents' responses reflected toward the level of agreement.

Table 3 Extrinsic motivation

Items	N	Mean	S.D.
I am motivated to participate in class activities if there is a possibility of earning rewards or prizes.	750	2.30	1.137
I am more likely to complete assignments if there are incentives offered for doing so.	750	2.25	1.083
The fear of disappointing my parents or teachers motivates me to work harder.	750	2.12	1.067
I am more likely to follow rules and instructions in school because I fear the consequences of not doing so.	750	2.16	1.092
Seeing others receive rewards or recognition for their academic achievements motivates me to do the same.	750	2.07	1.012
I am influenced by the expectations of my family members or friends regarding my academic performance.	750	2.11	1.047
I am more likely to participate in extracurricular activities if my friends are involved as well.	750	2.14	1.087
The prospect of scholarships or future career opportunities motivates me to excel academically.	750	2.08	1.075
I am more likely to engage in academic tasks if there are incentives such as extra credit or exemptions from assignments.	750	2.06	.979
I am motivated to perform well academically to impress my peers.	750	2.11	1.018

The above table illustrates the extrinsic motivation description. According to the respondents' responses, I am motivated to participate in class activities if there is a possibility of earning rewards or prizes ($M=2.30$; $SD=1.13$), I am more likely to complete assignments if there are incentives offered for doing so ($M=2.25$; $SD=1.08$), The fear of disappointing my parents or teachers motivates me to work harder ($M=2.12$; $SD=1.06$), I am more likely to follow rules and instructions in school because I fear the consequences of not doing so ($M=2.16$; $SD=1.09$), Seeing others receive rewards or recognition for their academic achievements motivates me to do the same ($M=2.07$; $SD=1.01$), I am influenced by the expectations of my family members or friends regarding my academic performance ($M=2.11$; $SD=1.04$), I am more likely to participate in extracurricular activities if my friends are involved as well ($M=2.14$; $SD=1.08$), The prospect of scholarships or future career opportunities motivates me to excel academically ($M=2.08$; $SD=1.07$), I am more likely to engage in academic tasks if there are incentives such as extra credit or exemptions from assignments ($M=2.06$; $SD=0.97$), I am motivated to perform well academically to impress my peers ($M=2.11$; $SD=1.01$). Overall, respondents' responses reflected toward the level of agreement.



The chart illustrates the effect of students' intellectual ability on overall motivation, intrinsic motivation, and extrinsic motivation, highlighting key statistical values. For overall motivation, the B value is 1.068, the Beta value is 0.492, and the t-value is 15.44. Intrinsic motivation shows a B value of 0.972, a Beta value of 0.435, and a t-value of 13.20. Similarly, extrinsic motivation demonstrates the highest B value of 1.165, a Beta value of 0.353, and a t-value of 10.33. These findings indicate a significant positive effect of intellectual ability on all motivation types, with the strongest standardized

Figure 1 Effect of Students' Intellectual Ability on Motivation

impact (Beta value) observed for overall motivation and the highest unstandardized impact (B value) for extrinsic motivation. The t-values across all categories confirm the high statistical significance of these relationships.

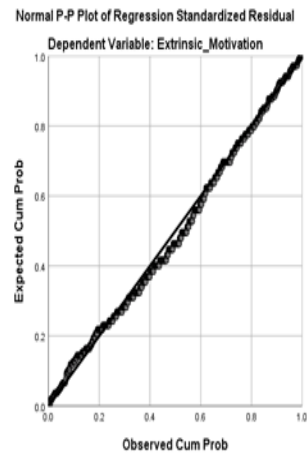
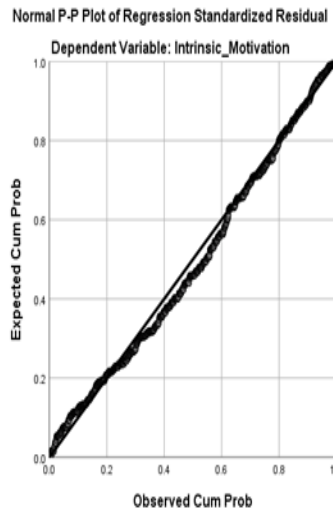
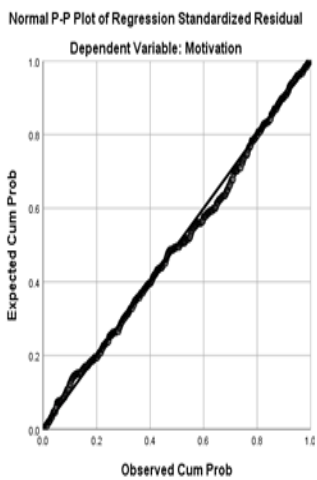


Table 4 Correlation Between Students' Intellectual Ability and Motivation

		Students Intellectual ability	Motivation
Students Intellectual ability	Pearson Correlation	1	.492**
	Sig. (2-tailed)		.000
	N	750	750
Motivation	Pearson Correlation	.492**	1
	Sig. (2-tailed)	.000	
	N	750	750

** . Correlation is significant at the 0.01 level (2-tailed).

Relationship between Students' intellectual ability and students' intrinsic motivation

		Students Intellectual ability	Intrinsic Motivation
Students' Intellectual ability	Pearson Correlation	1	.435**
	Sig. (2-tailed)		.000
	N	750	750
Intrinsic Motivation	Pearson Correlation	.435**	1
	Sig. (2-tailed)	.000	
	N	750	750

** . Correlation is significant at the 0.01 level (2-tailed).

Relationship between Students' intellectual ability and students' extrinsic motivation

		Students Intellectual ability	Extrinsic Motivation
Students Intellectual ability	Pearson Correlation	1	.353**
	Sig. (2-tailed)		.000
	N	750	750
Extrinsic Motivation	Pearson Correlation	.353**	1
	Sig. (2-tailed)	.000	
	N	750	750

** . Correlation is significant at the 0.01 level (2-tailed).

The table presents the correlation between students' intellectual ability and their overall motivation, intrinsic motivation, and extrinsic motivation, revealing significant positive relationships in all cases. For overall motivation, the Pearson correlation value is 0.492, indicating a moderate positive correlation, with a significance level of $p = 0.000$. Intrinsic motivation shows a slightly lower correlation value of 0.435, also representing a moderate positive relationship with intellectual ability, with a significance level of $p = 0.000$. Extrinsic motivation demonstrates the weakest correlation among the three, with a Pearson value of 0.353, reflecting a weak to moderate positive relationship, yet it remains statistically significant at $p = 0.000$. All correlations are significant at the 0.01 level, supported by a consistent sample size of 750 across all categories.

Discussion

The findings demonstrated that students' intellectual ability significantly influenced their motivation, highlighting both intrinsic and extrinsic motivational dimensions. Higher intellectual ability was associated with enhanced critical thinking, problem-solving skills, and a natural inclination toward learning, reflecting stronger intrinsic motivation (15). This relationship stemmed from a sense of competence and mastery that fostered self-driven engagement in academic tasks. Students with lower intellectual ability, however, exhibited greater reliance on extrinsic motivators, such as rewards, grades, or external approval, to sustain their academic efforts (16). The interplay between intellectual ability and motivation was observed to be highly dependent on contextual factors, including teacher support, family environment, and peer influence. Structured learning environments with clear expectations further amplified motivational benefits across different ability levels (17).

While the study illuminated the positive impact of intellectual ability on motivation, several strengths and limitations require consideration. The comprehensive sampling and statistically significant results provided robust evidence of these interactions (18). However, the moderate mean scores indicated a potential gap in achieving higher motivational outcomes, suggesting that additional

factors, such as emotional resilience and task relevance, might not have been fully captured (19). The reliance on self-reported measures also introduced the possibility of response biases, which could affect the interpretation of the data. Furthermore, the findings may have limited generalizability due to the absence of detailed demographic or socioeconomic considerations, which are known to influence both intellectual ability and motivation (20).

The relationship between intellectual ability and motivation was found to be dynamic and mediated by various intrinsic and extrinsic factors. High intellectual ability promoted intrinsic motivation by fostering curiosity and enjoyment in learning. Conversely, lower intellectual ability heightened dependence on external incentives, emphasizing the need for balanced interventions. Task alignment with intellectual capacity emerged as a critical factor, as mismatches in difficulty levels either demotivated or excessively challenged students. These findings underscored the necessity of addressing individual and contextual needs in educational practices to enhance motivational outcomes across ability levels. While the results provided valuable insights, the lack of exploration into how cultural and institutional differences mediate this relationship highlighted an area for future research. The findings reaffirmed the complex interdependence of intellectual ability and motivation, emphasizing the importance of tailored strategies to support diverse learners effectively.

CONCLUSION

The findings underscored the intricate relationship between intellectual ability and motivation, emphasizing their combined influence on learning outcomes. Intellectual ability forms the cognitive foundation for understanding and problem-solving, while motivation drives the persistence and willingness to engage in academic tasks. Students with higher intellectual ability demonstrated greater intrinsic motivation, often driven by curiosity and competence, whereas those with lower intellectual ability were more reliant on extrinsic motivators, such as rewards or recognition. However, these patterns are not absolute, as contextual and emotional factors also significantly shape motivational dynamics. The study highlighted the critical role of educators in bridging gaps by creating supportive and inclusive environments that align with students' intellectual levels and foster both intrinsic and extrinsic motivation. Tailored strategies, including differentiated instruction and fostering a growth mindset, were identified as essential for addressing diverse learner needs. Ultimately, academic success requires a holistic approach that integrates intellectual, emotional, and social dimensions, ensuring all students can achieve meaningful engagement and sustained motivation.

AUTHOR CONTRIBUTIONS

Author	Contribution
Fahd Naveed Kausar*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Muhammad Aziz Subhani	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Sofia Mansoor	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Nabeela Abid	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Muhammad Osama	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Ali Ghulam	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Shahid Khan	Contributed to study concept and Data collection Has given Final Approval of the version to be published

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